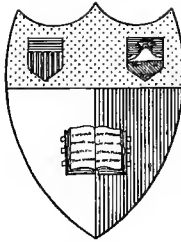


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AN ICE CREAM  
LABORATORY GUIDE

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W. W. FISK  
AND  
H. B. ELLENBERGER



New York  
State College of Agriculture  
At Cornell University  
Ithaca, N. Y.

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# An Ice Cream Laboratory Guide

BY

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Cornell University*

and

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NEW YORK

ORANGE JUDD COMPANY

1917

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## P R E F A C E

The manufacture of ice cream is based on certain scientific principles. It is the purpose of this laboratory manual to help the student to better understand the application of these principles. This manual, which is the result of several years' experience in teaching, is not intended as a textbook, but as a brief and concise outline of laboratory exercises. It will also serve as a suitable place for the student to record observations. The exercises have been prepared, so that each instructor may make selections and combinations suitable for the equipment and the needs of his course.

Because this is comparatively a new subject and the ideas regarding ice cream production and manufacture are constantly changing, the authors recognize that this manual will need frequent revisions. An effort will be made to keep it thoroughly up to date.

*Dairy Laboratories,  
New York State College of Agriculture,  
at Cornell University,  
Ithaca, New York,  
February, 1917.*



# An Ice Cream Laboratory Guide

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## LABORATORY EQUIPMENT

The exercises in this manual may be selected or easily modified, so that they will be suitable for any laboratory equipment. For example, the receipts have been prepared with the expectation that a 10-gallon freezer would be used; if a smaller freezer is used, the receipts may be reduced proportionally.

Much better instruction can be given if the equipment includes an artificial refrigerating plant for freezing and hardening the ice cream. If the equipment does not include an artificial refrigerating plant, a tub and can freezer, using an ice and salt mixture for freezing, and a wooden box for packing and hardening the ice cream, in ice and salt, may be used. The hardening box should be made of 2 inch matched lumber so that it will not leak. The size of the box will be determined by the amount of ice cream manufactured. It should be built in compartments which will hold six five gallon cans. This will require a box 26 inches wide by 32 inches deep by 36 inches long, outside measurement, with a hinged cover for each compartment.

If much ice cream is to be made an ice cream mixer is a necessity, but if a small amount is made each batch may be mixed in a 40 quart milk can. A homogenizer and emulsor may be included in the equipment.

With whatever type of freezer is used, there should be one or two small hand freezers, to freeze small

batches and to try new receipts. An ice crusher should be included for crushing ice.

The equipment should include the necessary small utensils, such as pails, dippers, ladles, spoons, thermometers, scales, measures, pack cans, etc.

There should be a suitable sink connected with hot and cold water and steam, for washing and scalding the utensils. A suitable rack should be provided for drying and holding the utensils and pack cans. Because of the salt used, care must be exercised, as it is liable to get on the utensils and cause them to rust.

All belts and gears on machines should be protected, so that persons cannot be caught and injured in them.



## EXERCISE NUMBER I

INSPECTION AND STUDY OF ICE CREAM  
MACHINERY*Artificial refrigerating systems.*

- I. State briefly the principles involved in an artificial refrigerating plant.
- II. Make drawings showing the working principles of the refrigerating system.
- III. Tell how to start and stop the compressor.

*Ice cream freezers.*

- I. Tell the principles on which the various types of freezers work.
- II. How can the temperature in the different types of freezers be regulated?

*Cleaning utensils.*

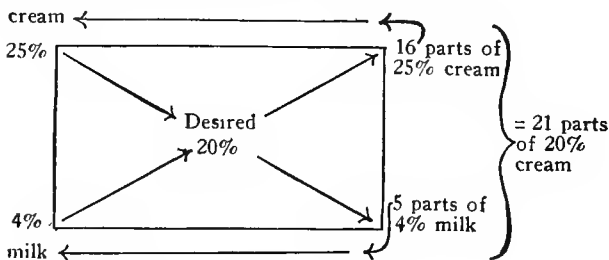
- I. How should utensils be washed? Why?
- II. Are all utensils so constructed that they may be easily and thoroughly cleaned? What provisions have been made to make cleaning easy?

**EXERCISE I REPORT**

## STANDARDIZATION

One of the main requirements for a successful ice cream business is uniformity of quality. In order to obtain this, it is necessary to have cream each time containing the same percentage of fat. As it is impossible to always get cream of a uniform fat content, the cream must be standardized. That is, the percentage of fat must be either increased or decreased to the desired amount. It is the usual practice to have richer cream than is to be used and reduce it by the addition of less rich cream, whole milk, or skim milk. If the cream was lower in percentage of fat than was desired, it could be standardized only by the addition of richer cream.

Prof. R. A. Pearson has devised a very simple method, known as the rectangular method of standardization. This method is as follows: draw a rectangle and place in the center the percentage of fat desired. At the left hand corners place the percentages of fat in the materials to be mixed. It is customary to place the larger figure at the top, thus:



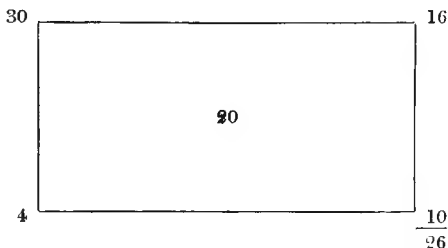
Then subtract diagonally, placing the remainders at the right hand corners, as shown above. These



show the proportions by weight in which the materials must be mixed to give the desired percentage of fat.

A problem may serve to illustrate the method.

How many pounds each of 30% cream and 4% milk are necessary to make 260 lbs. of 20% cream?



This shows 16 lbs. 30% cream and 10 lbs. 4% milk make 26 lbs. of 20% cream, but 260 lbs. is required. This is best solved by simple proportion:

10 lbs. milk : 26 lbs. 20% cream :: x lbs. milk : 260 lbs. 20% cream.

Solving  $x = 100$  lbs. 4% milk required and 260 lbs. — 100 lbs. milk = 160 lbs. 30% cream required which may also be determined by proportion.

To be sure no mistakes are made in figuring, it is best to prove all standardizations. The proof is simple.

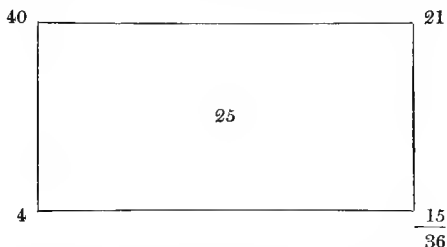
260 lbs. 20% cream	contains	52 lbs. fat (required).
160 lbs. 30%	“	“ 48 lbs. “
100 lbs. 4% milk	“	“ 4 lbs. “

—  
Making a total of 52 lbs. fat, the amount required.

In the above problem a definite amount of the mixture was required. There is another class of standardization problems in which the amount of one of the

materials is given, to find the quantity of the other required to standardize it:

How much 4% milk must be mixed with 420 lbs. of 40% cream to make a mixture testing 25% fat?



This shows that 15 lbs. of 4% milk will standardize 21 lbs. of 40% cream to a cream tasting 25% fat. But there are 420 lbs. of 40% cream to standardize. By simple proportion,

15 lbs. 4% milk : 21 lbs. 40% cream :: x lbs. 4% milk : 420 lbs. 40% cream.

Solving  $x = 300$  lbs. 4% milk

420 lbs. cream + 300 lbs. milk = 720 lbs. 25% cream.

Proof:

720 lbs. of 25% cream	contains	180 lbs. fat.
300 lbs. of 4% milk	"	12 lbs. "
420 lbs. of 40% cream	"	168 lbs. "

—————  
Making a total of 180 lbs. fat.



## EXERCISE NUMBER II

### STANDARDIZATION

Cream and milk to standardize will be furnished.

Test both by the Babcock method and report the result to the instructor, who will assign a definite percentage of fat for the standardized mixture.

After standardizing, test a sample of the standardized mixture by the Babcock method to test the accuracy of your work.

Report all calculations and results on opposite page.

**EXERCISE II REPORT**

## EXERCISE NUMBER III

## TESTING ICE CREAM FOR FAT

Ice cream cannot be tested for fat, by the Babcock test, as milk, because the acid chars the sugar, which interferes with the reading. Various methods of testing ice cream, so as to overcome this disadvantage have been devised. A few of the simpler ones follow.

Test a sample of ice cream by each of the following methods and report results on the opposite page.

Method of Prof. H. E. Ross: Mix equal parts by weight of melted ice cream and water. Weigh into a 9 gram 50% cream bottle 9 grams of the mixture. Add 17.5 cc. of glacial acetic acid. Shake for two to three minutes. Next add 15 cc. of sulphuric acid such as is used for the Babcock test. Shake for one minute and proceed as in the ordinary Babcock test. Multiply the reading by two.

Method of J. P. Dawson: Weigh 18 grams of melted ice cream at a temperature of 70 degrees F. into a 30%, 9 inch cream test bottle. Add 8 cc. of glacial acetic acid, agitate gently for 2 minutes and add 10 cc. of Babcock sulphuric acid. Shake and centrifuge in the usual manner.

Note: There appears to be no reason why one half the quantities of ice cream and acids may not be used in a 6 inch 9 gram 50% cream bottle.

Method often used by the authors: Weigh 9 grams of melted ice cream into a 6 inch 50%, 9 gram cream bottle and add about 9 cc. of water. Add three quarters of an acid measure of glacial acetic acid and mix thoroughly. Next add two thirds of an acid measure of Babcock sulphuric acid. Shake till well mixed and centrifuge in the usual manner.

**EXERCISE III REPORT**

## EXERCISE NUMBER IV

EFFECT OF THE SALT AND ICE MIXTURE  
ON TEMPERATURE

Make a brine one part salt to ten parts of water by weight. With part of this fill the can of a hand freezer two thirds full just as though it were an ice cream mix which you were going to freeze. Record the temperature of this brine.

*Trial 1.* Using a mixture of one pound of salt to 10 lbs. of crushed ice, try freezing the brine in the freezer can. Turn 10 minutes, keeping the freezer can well covered with the ice and salt mixture. Open and record the temperature of the brine in the can.

*Trial 2.* Empty the freezer can and tub and refill the can with more of the brine used in Trial 1. Be sure to have it the same temperature. Using a salt and ice mixture of the same proportions, pack the tub again and in addition add enough cold water so that it starts to run from the overflow hole in the tub. Turn the freezer 10 minutes, recording the temperature of the brine flowing from the overflow hole every 2 minutes. Be sure to keep the ice-salt-water mixture in the tub well mixed by punching with a stick such as a sawed-off broom handle. Again record the temperature of the brine in the can. Why does it differ from what it was in Trial 1?

*Trial 3.* Repeat Trial 2, except use a mixture of salt and ice one to six instead of one to 10. Record results.

*Trial 4.* Repeat Trial 3 but do not mix the ice, salt,



and water in the tub. Explain the difference in the results obtained in Trials 3 and 4.

Tabulate and report all the data which you have recorded.

### **EXERCISE IV REPORT**

## CLASSIFICATION OF ICE CREAM

In the absence of the adoption of any uniform standard classification of ice cream, the following classification in use by the authors is given. It is simple, yet comprehensive, and is arranged according to fundamental differences in composition. This seems to be the most logical basis for classifying ice cream and is very satisfactory from a laboratory standpoint. Exercises and representative formulas will be given for each of these classes.

I. Plain or uncooked ice cream, often known as Philadelphia ice cream, is made from cream, sugar, and flavoring, with or without condensed milk or some stabilizer. It may be subdivided as follows:

1. Plain—Flavors such as Vanilla, Chocolate, Carmel, Coffee, Mint, etc. *preserved, dried*
2. Fruit—Flavored with fresh or canned fruits such as Peach, Pineapple, Strawberry, Cherry, etc.
3. Nut—Flavored with such nuts as Walnut, Almond, Filbert, Chestnut, Pistachio, etc. *(extract)*
4. Bisque—Flavored with Marshmallows, Macaroons, Sponge Cake, Nabisco Wafers, Grape-nuts, etc.

*(5) moussé*  
 II. Cooked ice cream, often known as French or Neapolitan ice cream, is made from cream, <sup>or milk</sup> sugar, flavoring, and eggs. As custards they sometimes contain flour or cornstarch. The following subdivisions are recognized:

1. Parfaits or French—Flavors such as Vanilla, Chocolate, etc., are most common, but various fruits are sometimes used. *11*

2. Puddings—<sup>rich</sup> These are highly flavored with various dried and candied fruits, nuts, and spices. Examples are Nesselrode, Roman, and English Plum.
3. Custards—These contain flour, cornstarch, tapioca, or other similar ingredients, and are almost always flavored with vanilla.

III. Sherbets and Ices are made from water or milk, sugar, often egg albumen and a stabilizer, and flavored with fruit juices or other natural flavoring. The most prominent classes are the following:

1. Ices—Made from water, sugar and some natural flavoring without eggs or a stabilizer. This may include granites and frappés. Granites are frozen with little agitation, while frappés are only semi-frozen to a slushy consistency.
2. Water Sherbets—are made the same as ices with the addition of egg whites and sometimes a stabilizer. If the whole egg is used, they are sometimes called souffles.
3. Punches—are ices or water sherbets flavored with liquors or highly flavored with fruit juices and spices.
4. Milk Sherbets—Made from skimmed or whole milk, sugar, and egg whites, with or without a stabilizer and flavored with some natural flavoring.
5. Lacto—Made from skimmed or whole sour milk instead of sweet milk but in other respects they resemble milk sherbets.

IV. Mousse is a rich cream, sweetened and whipped to a stiff froth, flavored and frozen in moulds or cans.

In the laboratories at the New York state agricultural college 20% cream is used in making all plain or uncooked ice creams. Therefore in the following ex-

ercises and formulas a 20% cream is used as a base in most cases. This, however, may be reduced to 18% or 16% if it is thought desirable.

It must be remembered that the formulas given are for laboratory use and are not especially recommended as ideal formulas for commercial use. Many of them have given good results in commercial plants but there are so many variations and combinations possible that no single formula or group of formulas can be given as ideal for all commercial plants.

If the use of condensed milk is desired eight pounds of whole condensed milk may be substituted for the same amount of cream with excellent results in any of the formulas given for plain ice cream. Most commercial plants use condensed milk to give the ice cream more body and better standing quality.

## THE USE OF STABILIZERS

A stabilizer of some kind is generally admitted to be necessary in commercial ice cream. The three most commonly used are gelatin, ice cream powders and gum tragacanth.

Gelatin may be prepared in any of the three following ways, using either milk or water for dissolving it. However, if milk is used, ~~one~~ of the first two methods should be used, so as to avoid any cooked flavor from boiled milk.

1. Using one pint to one quart of water or milk to each two ounces of gelatin, soak the gelatin in the cold liquid for fifteen to thirty minutes. Then heat the mixture up to a temperature of 160 degrees to 170 degrees F. and add to the cream with rapid agitation.

2. The same as number one, except heat the mixture only to a temperature of 125 degrees to 130 degrees F. for a sufficient time to thoroughly dissolve all of the gelatin.

3. Heat the necessary amount of water to boiling, dump the gelatin into it and stir till dissolved. Then add to the cream with rapid stirring.

Ice cream powders should be used according to the directions given with them.

Gum tragacanth stock is made in the following manner. Place the dry gum in cold water, using one ounce of gum to four pounds of water. Heat slowly and uniformly over a low flame or better in a double boiler to a temperature of about 110 degrees F. Hold at this temperature for several hours or until the dry gum has absorbed all the water it will hold. It does not go into true solution in water but will absorb about

fifty times its own weight of the water. Strain through a coarse strainer and cool. It is then ready for immediate use. Sometimes enough is made at one time to last for several days, in which case it is best to add sufficient sugar to keep it from spoiling.



## EXERCISE NUMBER V

## FREEZING PLAIN ICE CREAM

Freeze ice creams after the following formulas, which may be reduced to suit the capacity of the freezer used. Eight pounds of whole condensed milk may be substituted for eight pounds of the cream if desired. Fill out the record blank on opposite page.

No. 1.

- 40 pounds of 20% cream
- 8 pounds of sugar
- 4 ounces of vanilla extract
- 4 ounces of gelatin if desired (See page 21)

No. 2.

- 40 pounds of 20% cream
- 8 pounds of sugar
- 2 ounces of vanilla extract
- 4 ounces of gelatin if desired (See page 21)
- 1 $\frac{1}{4}$  pounds cocoa dissolved in four pounds of boiling water with one pound of sugar.  
(Chocolate may be used.)
- Cinnamon to taste if desired.

No. 3.

- 40 pounds of 20% cream
- 8 pounds of sugar
- 2 ounces of vanilla extract
- 2 pounds of coffee (boil, strain and use enough to flavor to taste)
- 4 ounces of gelatin if desired (See page 21)

No. 4.

- 40 pounds of 20% cream
- 8 pounds of sugar
- 1 pint of creme de menth syrup
- 4 ounces of gelatin if desired (See page 21)
- Color pale green.



## EXERCISE V REPORT

Date.....1..... Receipt Number.....1.....

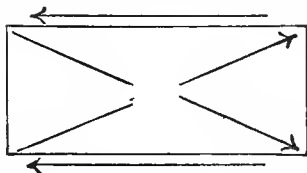
CREAM: 24 hrs  
 Age .....  
 Acidity .....  
 Temperature .....

ICE CREAM: 1/2  
 Gallons.....  
 Weight per gallon.....

STANDARDIZATION:  
 Per cent fat in cream.....  
 Per cent fat in milk.....  
 Standardize.....pounds of  
 cream testing.....per  
 cent fat.

SWELL:  
 Gallons..... Per cent.....

FREEZING:  
 Freezer used.....  
 Pounds ice used.....  
 Pounds salt used.....



Give proportion.  
 x = the pounds.....  
 Pounds of cream used.....  
 Pounds of milk used.....

TIME  
 Of starting freezer.....  
 That mix reaches 30° F.....  
 Required to reach 30° F.....  
 That freezing is completed  
 Total time required to  
 freeze.....

MIX  
 Pounds..... Gallons.....  
 Weight per gallon.....  
 Per cent fat it should  
 test.....

TEMPERATURE  
 Of mix entering freezer  
 Of brine when mix reaches  
 30° F.....  
 Of ice cream when removed  
 Of brine at this time.....

Was gelatin used?..... By method 1, 2 or 3?.....  
 In milk or water?.....  
 Remarks:

Comments on ice cream after it is hardened:

## EXERCISE NUMBER VI

## METHODS OF MEASURING SWELL

Freeze one or more batches of plain ice cream as assigned and measure the per cent. of swell in each of the following ways. Record results on the opposite page.

*Receipt:*

40 pounds of 20% cream

8 pounds of sugar

4 ounces of vanilla extract

4 ounces of gelatin if desired (See page 21)

1. Measure the gallons of mix used. Then measure in packing cans the gallons of ice cream obtained and calculate the per cent. of swell.

2. Weigh one gallon of the mix. Weigh the first gallon and the last gallon of ice cream removed from the freezer and calculate the per cent. of swell in each case.

3. Take two samples, preferably from different packing cans of ice cream from the same freezer, and determine the per cent. of swell by the method given in Bulletin 241 of the Wisconsin Station as follows: Take a 50 cc. sample of ice cream with the sampler furnished you and transfer to a 300 cc. beaker, using exactly 200 cc. of hot water to melt it. Then transfer all of this to a 250 cc. Florence flask and add 1 or 2 cc. of ether (measured) to reduce the foam. Next add enough water measured from a burette to fill the flask to the mark. The ether and water required represent the swell. Calculate the per cent. in each case.

Which method do you consider the most accurate for commercial use and why? For experimental use and why? Give special advantages of each test.

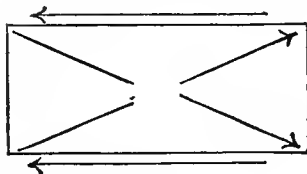
## EXERCISE VI REPORT

Date..... Receipt Number.....

## CREAM:

Age .....,  
Acidity .....,  
Temperature .....

## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

Give proportion.

x = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....Total time required to  
freeze.....

## TEMPERATURE

Of mix entering freezer  
.....  
Of brine when mix reaches  
30° F.....  
Of ice cream when removed  
.....  
Of brine at this time.....Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:

## HARDENING ICE CREAM

Ice cream may be of the highest quality when removed from the freezer and yet be ruined before it becomes hard enough to ship unless the hardening is properly accomplished. The two principal methods in use are the salt and ice method and the artificially cooled dry hardening room where the cans of ice cream are simply set in a very cold room and hardened by still or circulating cold air. The temperature of such a room should be maintained at near zero F. With either method the hardening process should not require more than twelve hours. The packing cans should always be cold before they are filled with ice cream, so as to prevent melting in the bottom.

*Directions for hardening in salt and ice.* Either ordinary packing tubs or a large box may be used for this purpose. If tubs are used, simply pack well with salt and ice mixed in the proportion of one to eight. It is necessary to repack these tubs two or three times a day in order to keep the ice cream hard. When several cans of ice cream are to be hardened at a time a better method, more economical in labor and material, is to pack the empty cans up to the covers in a large box, using salt and ice, one to eight. The soft ice cream is poured into these partly packed cans and when full they are completely covered with the ice and salt mixture. With such a box it is not necessary to repack oftener than twice a day.



## EXERCISE NUMBER VII

FREEZING FRUIT ICE CREAM—HARDEN-  
ING IN SALT AND ICE

Freeze fruit ice creams after the following formula, using such of the flavors as are assigned. Fill out record blank on opposite page.

*Receipt:*

40 pounds of 20% cream

8 pounds of sugar

4 ounces of gelatin in 4 pounds water

3 quarts pulped fruit

Color, if desired.

Flavors: Pineapple, raspberry, peach, cherry, strawberry. Either fresh or canned fruit may be used.

If a perpendicular freezer is used, the fruit should not be added until the ice cream begins to thicken, which will prevent the fruit settling to the bottom of the freezer.

Harden this ice cream in a salt and ice mixture.

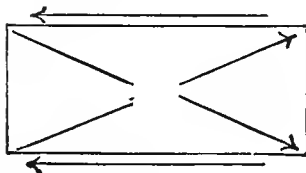
## EXERCISE VII REPORT

Date..... Receipt Number.....

## CREAM:

Age .....,  
Acidity .....,  
Temperature .....

## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

Give proportion.

 $x$  = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....  
That freezing is completed  
.....  
Total time required to  
freeze.....

## TEMPERATURE

Of mix entering freezer  
.....  
Of brine when mix reaches  
30° F.....  
Of ice cream when removed  
.....  
Of brine at this time.....Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....  
Remarks:

Comments on ice cream after it is hardened:

## EXERCISE NUMBER VIII

## NUT ICE CREAM

Freeze nut ice creams as assigned, using the formula given below. Fill out the record blank on opposite page.

Flavors: Walnut, filbert, almond and pistachio.

It is better if all of these, except the walnuts, are blanched before using by scalding with boiling water and removing the skins.

Prepare the nuts by running them through a meat chopper and add to the ice cream after it freezes enough to begin to thicken.

*Receipt:*

40 pounds of 20% cream

8 pounds of sugar

2 ounces of vanilla extract

4 ounces of gelatin in 4 pounds water

3 pounds of nut meats

If pistachio nuts are used, color the ice cream a pale green.



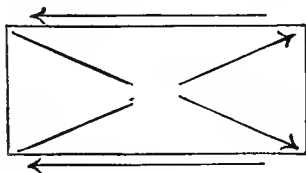
## EXERCISE VIII REPORT

Date..... Receipt Number.....

## CREAM:

Age .....,  
Acidity .....,  
Temperature .....

## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

Give proportion.

x = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used .....,  
Pounds salt used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....Total time required to  
freeze.....

## TEMPERATURE

Of mix entering freezer  
.....  
Of brine when mix reaches  
30° F.....  
Of ice cream when removed  
.....  
Of brine at this time.....Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:

## EXERCISE NUMBER IX

## BISQUE ICE CREAM

Freeze bisque ice cream after the base formula given below, using such of the following flavors as are assigned. Fill out the record blank on opposite page.

Flavors: Macaroons, sponge cake, grapenuts, and Nabisco wafers.

*Receipt:*

40 pounds of 20% cream

8 pounds of sugar

3 ounces of vanilla extract

4 ounces of gelatin in 4 pounds water

5 pounds pulverized bread product.

Any bread product used should be dried sufficiently so that it may be easily crushed into fine crumbs. If perpendicular freezer is used, do not add the crumbs until the ice cream freezes enough to begin to thicken.

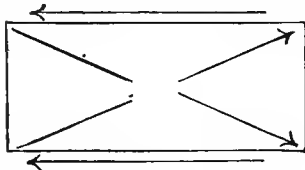
## EXERCISE IX REPORT

Date..... Receipt Number.....

## CREAM:

Age .....,  
Acidity .....,  
Temperature .....

## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

Give proportion.

x = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....Total time required to  
freeze.....

## TEMPERATURE

Of mix entering freezer  
.....Of brine when mix reaches  
30° F.....Of ice cream when removed  
.....

Of brine at this time.....

Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....  
Remarks:

Comments on ice cream after it is hardened:



## EXERCISE NUMBER X

MAKING BRICKS AND FANCY MOULDED  
ICE CREAMS

Freeze the following plain ice creams as assigned. Freeze in the order given. Fill out record blank on the opposite page and make bricks and molds of the ice cream as directed below.

*Receipts:*

## No. 1.

- 40 pounds of 20% cream
- 8 pounds of sugar
- 5 ounces of gelatin in 4 pounds water
- 4 ounces of vanilla extract

## No. 2.

- 40 pounds of 20% cream
- 8 pounds of sugar
- 5 ounces of gelatin in 4 pounds water
- 1 quart pulped strawberries
- 4 ounces strawberry extract
- Color pink

## No. 3.

- 40 pounds of 20% cream
- 8 pounds of sugar
- 5 ounces of gelatin in 4 pounds water
- 3 ounces of vanilla extract
- 1 $\frac{1}{4}$  pounds chocolate with 4 pounds of water and one pound of sugar (cocoa may be used if desired).

Fill the outside of a few center mold bricks with vanilla ice cream. Harden in a salt and ice mixture one part salt to two parts of ice. When hard

withdraw the center mold and fill with the strawberry or chocolate ice cream. Again pack in salt and ice to harden.

Fill a few fancy individual molds and pack in the salt and ice mixture till hard.

Each student should make a 3 layer tri-colored brick. First prepare the molds, attach your name and pack in salt and ice to become thoroughly cold. As the vanilla ice cream is drawn from the freezer fill each mold one third full and pack in the salt and ice mixture, so that it will be hardened by the time the strawberry ice cream is ready to be drawn off. Then fill another one third with the strawberry. Finish filling with the chocolate, being sure to have the brick so full of soft cream that no brine can enter under the lid. Care should be taken each time to have the bricks set level in the salt and ice.

## EXERCISE X REPORT

Date..... Receipt Number.....

## CREAM:

Age .....  
Acidity .....  
Temperature .....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

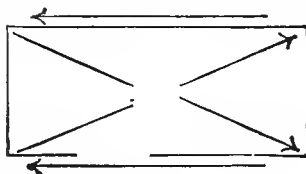
## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

## Give proportion.

 $x$  = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....Total time required to  
freeze.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## TEMPERATURE

Of mix entering freezer  
.....  
Of brine when mix reaches  
30° F.....  
Of ice cream when removed  
.....  
Of brine at this time.....Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:





## EXERCISE NUMBER XI

## CUSTARD ICE CREAM

Freeze custard ice creams after the following receipts as assigned and fill out report blank on opposite page. Quantities given are for hand freezers.

*Receipts:*

No. 1.

- 6 quarts of milk
- 3 pounds of sugar
- 24 eggs
- 12 tablespoonfuls of cornstarch
- 6 tablespoonfuls of vanilla or to taste.

Put the milk over the fire in a farina or double water boiler. Moisten the cornstarch with a little cold milk so that it can be added to milk without lumping. When the milk is hot, add the cornstarch and stir until it begins to thicken. Beat the eggs and sugar together until light and then add them to the hot milk. Cook a few minutes, take from fire, flavor and cool and freeze same as ice cream.

Other flavors as coffee or chocolate may be made by substituting these flavors for the vanilla.

No. 2.

- 5 quarts milk
  - 1 quart 30% cream
  - 8 eggs
  - 2½ pounds sugar
  - 6 tablespoonfuls flour
  - 1½ ounces of vanilla or to taste
- Follow directions given for No. 1.

## No. 3.

2 quarts 30% cream

4 quarts of milk

3 pounds of sugar

1½ quarts Minute Tapioca

yolks of 4 eggs

1 teaspoonful salt

4 teaspoonfuls lemon extract

2 teaspoonfuls rose extract

Cook the tapioca in two quarts of milk for 10 minutes, then add the rest of the milk, the sugar and salt. Cook ten minutes longer. Remove from fire and add the egg yolks well beaten. Then add the extract, cool, and freeze. When nearly done, add the cream previously beaten to stiff froth and finish freezing.

## EXERCISE XI REPORT

Date..... Receipt Number.....

## CREAM:

Age .....  
Acidity .....  
Temperature .....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

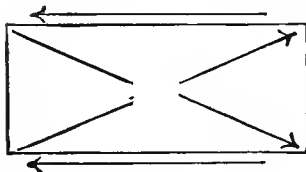
## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

Give proportion.

x = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....Total time required to  
freeze.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## TEMPERATURE

Of mix entering freezer  
.....  
Of brine when mix reaches  
30° F.....  
Of ice cream when removed  
.....  
Of brine at this time.....Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:



## EXERCISE NUMBER XII

## PARFAIT OR FRENCH ICE CREAM

Freeze the following receipts as assigned and fill out report blank on opposite page.

*Receipts:*

No. 1.

- 40 pounds of 20% cream
- 10 pounds of sugar
- 4 ounces of vanilla extract
- 8 dozen eggs well beaten.

Beat the egg yolks till smooth, add the sugar, and beat again till it is dissolved. Beat the whites to a stiff froth and stir into the yolks and sugar. Mix all with the cream and cook in a double boiler to a temperature of 180 degrees F. for 15 minutes. Cool to 40 degrees F., add vanilla and freeze.

No. 2.

- 40 pounds of 28% cream
- 10 pounds of sugar
- 4 ounces of vanilla extract
- 8 dozen eggs well beaten
- 2 quarts crushed strawberries

Beat whole eggs together, add to the mix and freeze, or the whites may be beaten separately if desired and added after the mix is partly frozen.

No. 3.

- 40 pounds of 25% cream
- 12 pounds of sugar
- 4 ounces of vanilla extract
- 4 pounds chopped walnut meats
- yolks of 8 dozen eggs

Beat the egg yolks till smooth, add the sugar and beat again. Then add to the cream and cook in double boiler to 180 degrees F. for 15 minutes. Cool, add the balance of the mix and freeze.

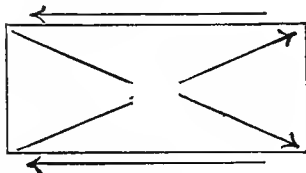
## EXERCISE XII REPORT

Date..... Receipt Number.....

## CREAM:

Age .....  
Acidity .....  
Temperature .....

## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

Give proportion.

x = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....Total time required to  
freeze.....

## TEMPERATURE

Of mix entering freezer  
.....  
Of brine when mix reaches  
30° F.....  
Of ice cream when removed  
.....  
Of brine at this time.....Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:





## EXERCISE NUMBER XIII

## PUDDINGS

Freeze the following puddings as assigned and fill out report blank on opposite page.

*Receipts:*

No. 1.—Nesselrode.

32 pounds 28% cream

10 dozen eggs

10 pounds of sugar

6 ounces vanilla

4 pounds chopped walnut meats

3 pounds chopped candied cherries

3 pounds chopped candied fruits

4 pounds chopped raisins

Cook the egg yolks with the cream. Beat the whites and add when partly frozen.

No. 2—English Plum.

32 pounds 25% cream

8 dozen eggs

12 pounds sugar

3 pounds cocoa or chocolate

5 pounds assorted fruits that do not pulp

2 pounds seeded raisins

3 pounds dates

4 pounds walnut meats

4 tablespoonfuls ground cinnamon

1 tablespoonful ginger

1 tablespoonful ground cloves

Use the eggs as directed under receipt number one. Chop the fruits and nuts fine.

## No. 3.—Fruit Pudding

32 pounds 10% cream

8 pounds whole condensed milk

8 pounds of sugar

5 ounces of gelatin dissolved in part of cream

2 pounds chopped cherries

2 pounds chopped raisins

2 pounds chopped nuts

1½ quarts sherry wine

**Soak the fruit over night in the sherry wine.**

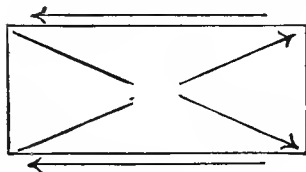
## EXERCISE XIII REPORT

Date..... Receipt Number.....

## CREAM:

Age .....,  
Acidity .....,  
Temperature .....

## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

Give proportion.

x = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....Total time required to  
freeze.....

## TEMPERATURE

Of mix entering freezer  
.....  
Of brine when mix reaches  
30° F.....  
Of ice cream when removed  
.....  
Of brine at this time.....Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:

## EXERCISE NUMBER XIV

## ICES

Freeze the following water ices as assigned and fill out record blank on opposite page.

*Receipts:*

No. 1.

- 48 pounds of water
- 20 pounds of sugar
- 6 pounds of lemon juice

No. 2.

- 48 pounds of water
- 20 pounds of sugar
- 2 pounds of lemon juice
- 4 quarts pineapple juice

No. 3.

- 48 pounds of water
- 20 pounds of sugar
- 2 pounds of lemon juice
- 4 quarts finely pulped strawberries

No. 4. Same as number two, except freeze very rapidly with little agitation. This is often called a granite.

## EXERCISE XIV REPORT

Date..... Receipt Number.....

## CREAM:

Age .....,  
Acidity .....,  
Temperature .....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

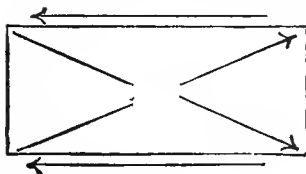
## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

Give proportion.

 $x$  = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....Total time required to  
freeze.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## TEMPERATURE

Of mix entering freezer  
.....Of brine when mix reaches  
30° F.....Of ice cream when removed  
.....

Of brine at this time.....

Was gelatin used?..... By method 1, 2 or 3?.....

In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:

## EXERCISE NUMBER XV

## WATER SHERBETS

Freeze the following sherbets as assigned and fill out record blank on opposite page.

*Receipts:*

No. 1.

48 pounds water

16 pounds sugar

1 pound lemon juice

4 quarts grated pineapple (or pineapple juice)

6 ounces of gelatin in 4 pounds of water, if desired

24 egg whites beaten stiff and added when mixture is partly frozen

No. 2. Same as number one except replace the pineapple with grape juice.

No. 3. Use same mix as number one except replace the pineapple with orange juice. Boil the water and sugar to a clear syrup, then strain and cool before freezing.

## EXERCISE XV REPORT

Date..... Receipt Number.....

## CREAM:

Age .....  
Acidity .....  
Temperature .....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

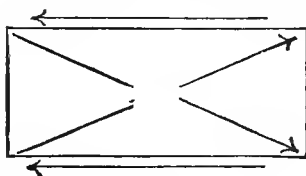
## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....Total time required to  
freeze.....

Give proportion.

 $x =$  the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## TEMPERATURE

Of mix entering freezer  
.....Of brine when mix reaches  
30° F.....Of ice cream when removed  
.....

Of brine at this time.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

Was gelatin used?..... By method 1, 2 or 3?.....

In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:

## EXERCISE NUMBER XVI

## MILK SHERBETS

Freeze milk sherbets after the following base formula, using such of the flavorings as are assigned. Fill out the record blank on the opposite page.

Flavors: Orange, grape, cherry, pineapple, and strawberry. If lemon is desired, use only two quarts of lemon juice with a quart of orange juice.

*Receipt:*

- 48 pounds of milk
- 16 pounds of sugar
- 5 ounces of gelatin in 2 quarts water
- 1 pound lemon juice
- 4 quarts fruit flavoring
- 12 egg whites beaten stiff and added after mixture is partly frozen.



## EXERCISE XVI REPORT

Date..... Receipt Number.....

## CREAM:

Age .....  
Acidity .....  
Temperature .....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

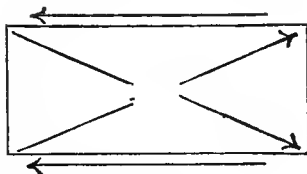
## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

Give proportion.

x = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....Total time required to  
freeze.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## TEMPERATURE

Of mix entering freezer  
.....  
Of brine when mix reaches  
30° F.....  
Of ice cream when removed  
.....  
Of brine at this time.....Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:

## EXERCISE NUMBER XVII

## PUNCHES AND LACTO

Freeze the following formulas as assigned and fill out the record blank on opposite page:

*Punches:*

## No. 1.

- 48 pounds water
- 20 pounds sugar
- 1 pound lemon juice
- 1 quart brandy and rum mixed

## No. 2.

- 48 pounds water
- 20 pounds sugar
- 1 pound lemon juice
- 1 quart orange juice
- 2 quarts wine
- 4 ounces gelatin in part of the water

## No. 3.

- 48 pounds water
- 20 pounds sugar
- 1 quart lemon juice
- 1 quart raspberry juice
- 1 quart grape juice
- cloves, cinnamon, allspice and nutmeg to taste.

## Lacto (From Iowa Station Bulletin 140)

- 48 pounds good starter just nicely coagulated
- 18 pounds sugar
- 24 eggs, whites and yolks beaten separately
- 2 quarts of grape juice
- 1½ quarts lemon juice

Mix in the order given in the formula. Other flavors may be substituted for the grape juice.

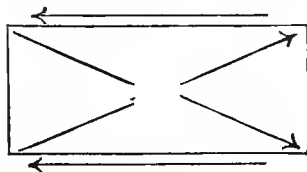
## EXERCISE XVII REPORT

Date..... Receipt Number.....

## CREAM:

Age .....,  
Acidity .....,  
Temperature .....

## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

Give proportion.

x = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....Total time required to  
freeze.....

## TEMPERATURE

Of mix entering freezer  
.....  
Of brine when mix reaches  
30° F.....  
Of ice cream when removed  
.....  
Of brine at this time.....Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:

## EXERCISE NUMBER XVIII

## MOUSSE

Prepare and freeze mousse after the following formulas as assigned.

No. 1.—For five gallons

20 pounds aged sweet cream, at least 40% fat

5 pounds sugar

6 ounces of gelatin

juice of three lemons

3 quarts strained strawberry juice

Dissolve the sugar in the fruit juice, then stir in the gelatin dissolved in a very little water. Chill this mixture but not enough to form a jelly. Whip the cold cream till stiff and then fold in the gelatin-sugar-fruit mixture.

Pack into molds or cans and harden in a salt and ice mixture one to two. Other flavors may be substituted.

No. 2.—For five gallons

20 pounds of aged sweet cream, 35% fat

4 pounds of sugar

5 ounces of gelatin

2½ ounces of vanilla

Dissolve the gelatin and stir into the cream. Whip till stiff, then fold in the sugar and vanilla and pack in cans, hardening in salt and ice mixed one to two.

Report results on opposite page.

**EXERCISE XVIII REPORT**

## EXERCISE NUMBER XIX

**STANDARDIZE MIX TO A GIVEN PERCENT-  
AGE OF FAT**

The following materials will be furnished: cream, milk, sugar, chocolate, fruit, vanilla and gelatin. From them make up a receipt and freeze a batch of ice cream to contain a given per cent. of fat as assigned.

Test the frozen ice cream for fat and report the result to the instructor at time of testing.

Include your receipt and all calculations and tests on opposite page.

Mark plainly each can of ice cream with the receipt number, your name, and the date.

- No. 1. Vanilla ice cream to test 14% fat.
- No. 2. Vanilla ice cream to test 12% fat.
- No. 3. Vanilla ice cream to test 9½% fat.
- No. 4. Fruit ice cream to test 11% fat.
- No. 5. Chocolate ice cream to test 12% fat.

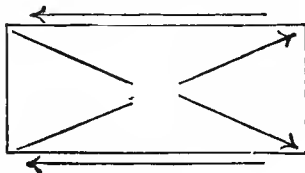
## EXERCISE XIX REPORT

Date..... Receipt Number.....

## CREAM:

Age .....  
Acidity .....  
Temperature .....

## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

Give proportion.

 $x$  = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....Total time required to  
freeze.....

## TEMPERATURE

Of mix entering freezer  
.....  
Of brine when mix reaches  
30° F.....  
Of ice cream when removed  
.....  
Of brine at this time.....Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:

## SCORE CARD FOR ICE CREAM

The comparison of ice creams is accomplished best by reducing their quality to a numerical basis. This is done by use of a score card. Two score cards are suggested as follows:

<i>Cornell Score Card</i>		<i>Modification of the Wisconsin Score Card</i>	
Flavor .....	45	Flavor .....	40
Body and texture.....	35	Body and texture.....	25
Richness .....	10	Bacterial count.....	15
Appearance .....	5	Richness .....	10
Package .....	5	Appearance .....	5
		Package .....	5
	100		100

It may be more advantageous to use the Cornell score card in the Laboratory because immediate results can be obtained, while with the modified Wisconsin score card bacterial counts must be made of the ice cream, so that it would be two to three days before the final score of the ice cream could be obtained.

### DISCUSSION OF QUALITIES OF ICE CREAM

*Flavor.* The ice cream should have a pronounced flavor which will blend with the flavor of the cream to give a clean, desirable typical flavor.

*Body and Texture.* The body should be firm and mellow. It should not be tough or rubbery neither soft or mushy. The texture should be smooth and velvety and entirely free from graininess and lumpiness.

*Richness.* If the ice cream meets the legal requirements, it should be given a perfect score. If it falls below the legal requirement, it should be scored zero.



*Appearance.* The ice cream should have an attractive appearance and be of the characteristic uniform color.

*Package.* The package should be neat and clean and, if for long shipment, some provision should be made to protect the ice on top of the packing tub.

*Bacterial count.* An ice cream which has a count of 20,000 should be considered perfect. For each increase of 20,000 above this one point should be deducted from the score.

*Application of score card.* When judging samples of ice cream, it is best to try some of them to obtain some idea of the qualities of the samples to be scored. This is necessary so that the score will not run above 100 and to set a standard. Then with a definite standard in mind, the samples may be carefully scored. The cuts in score should be made in proportion to the quality of the ice cream and the definite standard in mind.

## EXERCISE NUMBER XX

### JUDGING PLAIN ICE CREAM

Score and criticize the samples of plain ice cream recording the scores on the opposite page. (For score card see page 64.)

One sample will first be scored by the instructor as an example and guide to the severeness of the cut for different defects. After the students have finished, he will score the remaining samples with them.

Three of the samples are ice cream made in the college laboratory. The others are purchased and represent well known commercial ice creams.

After scoring on all other points make a fat test of each sample. (See page 14.)



## EXERCISE NUMBER XXI

THE EFFECT OF FAT CONTENT ON ICE  
CREAM

*Part I.* Freeze ice creams after the following formulas as assigned.. Each has a different percentage of fat. Fill out the record blank on opposite page and mark plainly each can of ice cream with the receipt number, your name and the date.

*Receipts:*

No. 1.

40 pounds of 10% cream

8 pounds of sugar

4 ounces of vanilla extract

4 ounces gelatin in 4 pounds water.

No. 2. Same as No. 1 except use 15% cream.

No. 3. Same as No. 1 except use 20% cream.

No. 4. Same as No. 1 except use 30% cream.

No. 5. Same as No. 1 except use 40% cream.

*Part II.* After hardening or next laboratory period score and criticize the ice cream made in Part I. Fill in the score blank on page 90.

## EXERCISE XXI REPORT

## PART I

Date..... Receipt Number.....

## CREAM:

Age.....  
Acidity.....  
Temperature.....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

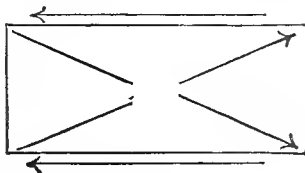
## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....  
That freezing is completed  
.....  
Total time required to  
freeze.....

## Give proportion.

x = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## TEMPERATURE

Of mix entering freezer  
.....  
Of brine when mix reaches  
30° F.....  
Of ice cream when removed  
.....  
Of brine at this time.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....  
Remarks:

Comments on ice cream after it is hardened:

## EXERCISE NUMBER XXII

THE EFFECT OF DIFFERENT BINDERS ON  
ICE CREAM

*Part I.* Freeze the following mixes as assigned. Fill out record blank on opposite page, and mark each can of ice cream plainly with receipt number, your name and date.

*Receipts:*

No. 1.

40 pounds 16% cream

8 pounds sugar

4 ounces vanilla

2 quarts of gum stock (See page 21)

No. 2. Same as No. 1 except use 4 ounces of gelatin in  $3\frac{1}{2}$  pounds of water as a binder.

Nos. 3, 4, 5. In these use different ice cream powders as binders, following the directions given with each powder as to quantities to use and method of mixing. Use a formula which will give the same per cent. of fat and solids not fat as No. 1.

*Part II.* After hardening or at the next laboratory period score and criticize the ice creams made in Part I. Fill out the score blank on page 91.

## EXERCISE XXII REPORT

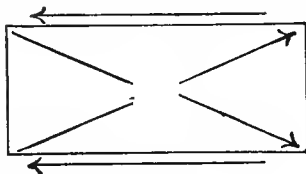
## PART I

Date..... Receipt Number.....

## CREAM:

Age .....,  
Acidity .....,  
Temperature .....

## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

Give proportion.

x = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....Total time required to  
freeze.....

## TEMPERATURE

Of mix entering freezer  
.....Of brine when mix reaches  
30° F.....Of ice cream when removed  
.....

Of brine at this time.....

Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:

## EXERCISE NUMBER XXIII

**THE EFFECT OF VARYING PERCENTAGES  
OF MILK SOLIDS NOT FAT ON  
ICE CREAM**

*Part I.* Freeze the following mixes as assigned. Fill out record blank on opposite page. Mark each can of ice cream you freeze with receipt number, your name and date. Calculate and record the approximate per cent of fat and of milk solids not fat in each mix.

<i>Receipts</i>	<i>No. 1</i>	<i>No. 2</i>	<i>No. 3</i>	<i>No. 4</i>
Cream .....	40 lbs.	35 lbs.	30 lbs.	25 lbs.
	15%	15½%	16 2/3%	18%
Whole Condensed Milk .....		5 lbs.	10 lbs.	15 lbs.
Sugar .....	8 lbs.	8 lbs.	8 lbs.	8 lbs.
Vanilla .....	4 oz.	4 oz.	4 oz.	4 oz.
Gelatin .....	4 oz.	4 oz.	4 oz.	4 oz.
Water .....	4 lbs.	4 lbs.	4 lbs.	4 lbs.
Per cent Fat.....				
Per cent Milk S. N. F.				

*Part II.* After hardening or at next laboratory period score the ice creams as made above. Fill out the score blank on page 92.



## EXERCISE XXIII REPORT

## PART I

Date..... Receipt Number.....

## CREAM:

Age .....  
Acidity .....  
Temperature .....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

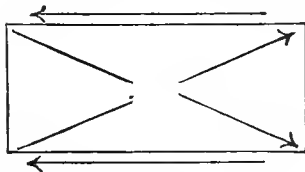
## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

Give proportion.

 $x =$  the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....  
That freezing is completed  
.....  
Total time required to  
freeze.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## TEMPERATURE

Of mix entering freezer  
.....  
Of brine when mix reaches  
30° F.....  
Of ice cream when removed  
.....  
Of brine at this time.....Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:

## EXERCISE NUMBER XXIV

**FREEZE ICE CREAM FROM RAW, PASTEURIZED, EMULSIFIED AND HOMOGENIZED CREAM**

Note effect on swell and quality of ice cream.

In order to have the ice cream in condition to make easy comparison, it should all be made after the same receipt.

40 pounds 20% cream

8 pounds sugar

4 ounces vanilla extract

4 ounces gelatin in 4 pounds water

With sufficient fresh cream to make four batches of ice cream, divide the cream into four equal parts.

- I. Freeze one part directly.
  - II. Pasteurize one part and freeze.
  - III. Emulsify one part and freeze.
  - IV. Homogenize one part and freeze.
- If desired all may be aged before freezing.  
Fill out record blank on opposite page.

## EXERCISE XXIV REPORT

Batch Number.....	1	2	3	4
Pounds of Mix.....				
Gallons of Mix.....				
Temperature of Mix.....				
Time of Starting Freezer.....				
Time of Stopping Freezer.....				
Temperature of Ice Cream.....				
Gallons of Ice Cream.....				
Gallons of Swell.....				
Per Cent of Swell.....				

Comments :

## EXERCISE NUMBER XXV

**THE EFFECT OF AGING CREAM ON THE  
VISCOSITY AND SWELL**

Twenty per cent. cream of nearly uniform quality will be furnished you, of the following ages from the separator: three to four hours, one day, two days, three days, and five days. Freeze a batch of each as assigned, using the following formula, and pay special attention to the swell obtained.

Also test each cream for viscosity by dropping from a pipette on an inclined glass, taking care to have the glass and pipette of even temperature for each trial.

Fill out blank report on opposite page.

*Receipt:*

- 40 pounds 20% cream
- 8 pounds sugar
- 4 ounces vanilla extract
- 4 ounces gelatin in 4 pounds water.

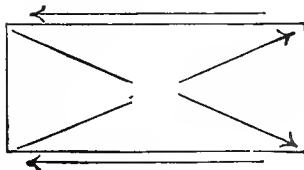
## EXERCISE XXV REPORT

Date..... Receipt Number.....

## CREAM:

Age .....,  
Acidity .....,  
Temperature .....

## STANDARDIZATION:

Per cent fat in cream.....  
Per cent fat in milk.....  
Standardize.....pounds of  
cream testing.....per  
cent fat.

Give proportion.

x = the pounds.....  
Pounds of cream used.....  
Pounds of milk used.....

## MIX

Pounds..... Gallons.....  
Weight per gallon.....  
Per cent fat it should  
test.....

## ICE CREAM:

Gallons.....  
Weight per gallon.....

## SWELL:

Gallons..... Per cent.....

## FREEZING:

Freezer used.....  
Pounds ice used.....  
Pounds salt used.....

## TIME

Of starting freezer.....  
That mix reaches 30° F.....  
Required to reach 30° F.  
.....That freezing is completed  
.....  
Total time required to  
freeze.....

## TEMPERATURE

Of mix entering freezer  
.....  
Of brine when mix reaches  
30° F.....  
Of ice cream when removed  
.....  
Of brine at this time.....Was gelatin used?..... By method 1, 2 or 3?.....  
In milk or water?.....

Remarks:

Comments on ice cream after it is hardened:

## EXERCISE NUMBER XXVI

**THE EFFECT OF THE TEMPERATURE OF  
THE MIX AS IT ENTERS THE FREEZER  
ON THE SWELL**

Make enough mix for four 10 gallon batches of ice cream, using the following formula:

40 pounds of 20% cream

8 pounds of sugar

4 ounces of vanilla extract

4 ounces of gelatin in 4 pounds water.

Freeze the first batch as a preliminary one. Have the second at a temperature of 40 degrees F., when it enters the freezer, the third at 50 degrees F., and the fourth at 60 degrees F. Warm to these temperatures before placing mix in freezer. Note swell obtained. Explain.

Fill out record blank on opposite page.

## EXERCISE XXVI REPORT

	1	2	3	4
Batch Number.....				
Pounds of Mix.....				
Gallons of Mix.....				
Temperature of Mix.....				
Time of Starting Freezer.....				
Time of Stopping Freezer.....				
Temperature of Ice Cream.....				
Gallons of Ice Cream.....				
Gallons of Swell.....				
Per Cent of Swell.....				

Comments :

## EXERCISE NUMBER XXVII

**EFFECT OF THE TIME OF FREEZING ON  
THE SWELL AND QUALITY OF  
ICE CREAM**

Make enough mix for four 10 gallon batches of ice cream, using the following formula:

40 pounds of 20% cream

8 pounds of sugar

4 ounces of vanilla extract

4 ounces of gelatin in 4 pounds water

Freeze the first batch as a preliminary one. Regulate either the temperature or quantity of brine so that the second batch will freeze in four minutes, the third in fifteen minutes, and the fourth in thirty minutes.

Note particularly the effect on the swell and quality.

Fill out the record blank on opposite page.



## EXERCISE XXVII REPORT

Batch Number.....	1	2	3	4
Pounds of Mix.....				
Gallons of Mix.....				
Temperature of Mix.....				
Time of Starting Freezer.....				
Time of Stopping Freezer.....				
Temperature of Ice Cream.....				
Gallons of Ice Cream.....				
Gallons of Swell.....				
Per Cent of Swell.....				

**Comments:**

## EXERCISE NUMBER XXVIII

## BACTERIAL COUNTS OF ICE CREAM

This exercise is to be performed once during the course by each student as assigned.

Sterile glassware and media will be furnished you. Weigh or measure the samples for dilution as instructed.

Take samples as indicated below in sterile bottles and plate on plain lactose agar. Incubate at 37 degrees C., for 48 hours..

Sample of cream. Dilutions 1/10,000 and 1/100,000.

Sample of gelatin. Dilutions 1/10 and 1/100.

Sample of vanilla. Dilutions 1/10.

Sample of sugar. Dilutions 1/10.

Sample of mix. Dilutions 1/10,000 and 1/100,000.

Sample of ice cream from freezer. Dilutions 1/10,000 and 1/100,000.

Sample of ice cream after it has remained in the hardening room one week. Make dilutions of 1/10,000 and 1/100,000.

Report results on the blank page opposite.

**EXERCISE XXVIII REPORT**

## EXERCISE NUMBER XXIX

## TESTING SAMPLES OF GELATIN

Weigh 5 gram samples of gelatin into 100 cc. of cold water in beakers or jelly glasses. Allow it to soak over night. Then heat slowly, with stirring, to 80 degrees C.

Subject to the following tests and make report on opposite blank page.

1. Note the odor.
2. Determine the time required for 50 cc. to run from a pipette.
3. Determine the time required for the sample to gelatinize.
4. Turn the jelly out on to a plate and determine the relative resistance of the different samples to pressure by the finger.

Two or more students should be assigned to this exercise at a time, each having a different sample of gelatin. They should perform the tests together.

**EXERCISE XXIX REPORT**

## EXERCISE NUMBER XXX

**TRIP TO COMMERCIAL PLANTS**

Visit at least one large commercial plant some time during the term and report on the following points.

Points to be observed in an ice cream plant.

1. Method of securing the raw product.
2. Is cream pasteurized?
3. If possible, amounts and materials used in mix.
4. Is condensed milk used?
5. What stabilizer is used?
6. Time of aging cream or mix.
7. Kinds of freezer and ice machine.
8. Temperature of brine to freeze.
9. Composition of ice cream.
10. Sketch of arrangement of plant.
11. Power used for delivering.
12. Method of checking up drivers.
13. Any other points of interest.

**EXERCISE XXX REPORT**

**EXERCISE NUMBER XXXI****STUDENTS' RECEIPTS**

Each student should hand in one receipt for ice cream. This receipt should be one which has been previously tried, preferably at home.

During the term these receipts will be made.

Note the quality of the ice cream.

Is the ice cream a good commercial ice cream?

Could it be made on a commercial basis profitably?



**EXERCISE XXXI REPORT**













